The movements of this hurricane were amply covered by advisories and warnings issued by the Weather Bureau.

September 19–24.—A rather weak tropical disturbance, 1,006 millibars (29.71 inches), formed on the morning of September 19, 1940, in the vicinity of Bluefields, Nicaragua. It progressed in a northwestward direction over the Gulf of Honduras during the next 24 hours and moved inland over Quintana Roo during the night of September 20. By the afternoon of September 21 the depression had entered the Gulf of Mexico, northwest of Progresso. Yucatan, attended by winds of force 4–5 (Beaufort Scale).

The disturbance continued to move northwestward increasing slowly in intensity after passing into the Gulf of Mexico. On the morning of September 23, it was centered near latitude 27°45′ N., and longitude 95°30′W. An unidentified vessel in the western portion of the Gulf of Mexico at 5 a. m. of the 23d, encountered a fresh gale from the northwest. That afternoon, the depression moved very slowly and curved rather sharply to the northeast. The tanker *Dannedaike* met a fresh southwest gale near 28° N., and 95° W., at 7 p. m. of the 23d, with the lowest pressure reading of the storm, 1,004 millibars (29.65 inches).

During the early morning of September 24 the disturbance passed inland over southwestern Louisiana, a short distance to the west of Lafayette. Heavy rains were associated with this storm over southern Louisiana and along the upper coast to Texas, the heaviest amount reported being 7.10 inches at Cheneyville, La.

The depression, decreasing in intensity after passing inland, continued to move northeastward and merged with a low-pressure trough which dominated the south-central and eastern portions of the United States, during the evening of September 24.

Advisories and warnings were issued by the forecast center at New Orleans, La., from September 21, when the disturbance entered the Gulf of Mexico, until it moved inland and diminished rapidly on the 24th.

A diagram showing the tracks of these disturbances appears herewith.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR SEPTEMBER 1940

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

By EARL C. THOM

The mean surface temperatures during September (chart I) were above normal over the western and north-central parts of the United States, and but slightly below normal over most of the rest of the country. A considerable area in the north central and extreme north portions of the country averaged 6° F., or more, above normal with the maximum positive departure of about 8° F. occurring in scattered areas of Montana and northeastern Wyoming. In three small widely scattered areas of the east and south temperatures for the month were 4° F. below normal.

At the 1,500 m. level the direction of the 5 a. m. resultant wind for the month (chart VIII) was north of the corresponding normal resultant (clockwise turning) over all of the eastern half of the country and at San Diego with the opposite departure from normal direction over the rest of the country. At the 3,000 m. level (chart IX) the same general departure of the 5 a. m. resultant direction from normal was noted except that the counter clockwise turning from normal was also noted at Houston and at Key West. At 5,000 meters the 5 p. m. resultant direction (chart X) when compared to the 5 a. m. normals at that level show southward turning from normal in the area west of a line from Duluth to El Paso, while all stations east of this line, except Arlington, show resultants more northerly than normal.

The 5 a. m. resultant velocities for the month were above the corresponding normal in the southwest and extreme west parts of the country at the 1,500 m. level and were generally below normal over the rest of the country. The resultant velocities were about 3 m. per second above normal along the California coast and averaged about 3 m. per second below normal over the northern Great Lakes and the extreme north central region. At the 3,000 m. level the 5 a. m. resultant velocities were below normal over most of the northern half of the country and were generally above normal to the southward. At the 5,000 m. level the September 5 p. m. resultant velocities were considerably above the corresponding 5 a. m. normals over most of the country.

Reference to chart I indicates that the mean temperatures in the area west of a line drawn across the United States through St. Louis, Mo., and Abilene, Tex., were above normal for September while temperatures in the rest of the country were below normal. This division of the country corresponds closely to the corresponding northward and southward departures from normal of the resultant directions for the month at the 1,500 m., 3,000 m., and 5,000 m. levels.

In September the directions of the 5 p. m. resultant winds at 1,500 meters were north of the corresponding 5 a. m. resultants at this level over the northwest and the Rocky Mountain region while, except at two stations, the resultant winds turned to the southward during the day over the rest of the country. At the 3,000 m. level the resultant winds turned to the northward during the day over the western one-third of the country and turned to the southward over the central one-third while the shifts were well distributed at this level over the Eastern States.

At the 1,500 m. level the resultant velocities at 5 p. m. for the month were higher than the corresponding 5 a. m. velocities over about half of the country, including New England, the extreme Northern States, the Southwest and and most of the South Central and Gulf Coast States. At 3,000 m. the change in resultant velocities from 5 a. m. to 5 p. m. were again well distributed, the velocities in the evening being higher than the morning velocities over the New England States, over Florida, and over most of the central and west central region.

The upper air wind data discussed above are based on 5 a. m. observations (charts VIII and IX) as well as on observations made at 5 p. m. (table 2, charts X and XI).

At all 1,000 m. levels from 4,000 m. up to 18,000 m. above sea level the highest pressures observed over the country (table I) occurred on or near the southwest boundary line of the United States, the maximum pressure at each of these levels being recorded at one or more of the three stations Brownsville, El Paso, or Phoenix. The lowest pressure over the United States at each 1,000 m. level from 4,000 m. to 17,000 m., occurred at Sault Ste. Marie. At 3,000 m. the same minimum pressure (707 mb.) occurred at Sault Ste. Marie as at several other stations, while at 18,000 m. a low pressure reading of 78

mbs. occurred at eight stations, including Sault Ste. Marie.

Mean pressures at the three levels, surface, 500 m., and 1,000 m. were lower in September than in August this year over the extreme West, the Great Lakes, the Northeast, and over the East Central States, while pressures were higher over the rest of the country at these levels. Except for several small pressure increases in the Central States at the lower levels, all September mean pressures were lower than in August over the United States from 1,500 m. up to at least 14,000 m. This decrease in pressure was especially marked along the Pacific coast and along the North Atlantic coast, for example, the average decrease in pressure for these levels was 6 mb. at both Medford and Lakehurst while a decrease of 9 mb. was noted at Medford at both the 8,000 m. and 11,000 m. levels.

A difference of 15 mb. between the highest and the lowest mean pressure was observed in September at the five 1,000 m. levels from 7 to 11 km. Steep pressure gradients were noted between Sault Ste. Marie and Joliet at the 8- and 9-km. levels and between San Diego and Phoenix at the three levels, 8, 9, and 10 km.

Temperatures were lower in September this year than in August at all levels below 11,000 m. At the 13,000 m. level temperatures over all stations in the western one-third of the country as well as over Sault Ste. Marie and over Lakehurst were higher than in August. At the next five higher 1,000 m. levels temperatures were in general lower than in August over the central one-third of the country and higher over the rest of the United States. At 15,000 m. for example, the mean temperature for September was 4.8° C. higher than in August at Medford, 4.2° higher at Lakehurst, and 2.4° lower at Omaha.

Considering the temperatures for all levels over the country as a whole September was colder in 1940 than in 1939. Except at Bismarck, Denver, and Phoenix stations reported mean temperatures lower than those for September 1939 at the four lower levels, 1,000 m., 2,000 m., 3,000 m., and 4,000 m. At most of the 1,000 m. levels from 5,000 to 11,000 m. the mean temperatures were still lower than last year except at the same three stations. Above 11,000 m. up to at least 17,000 m., the mean temperatures were generally higher than in 1939.

The altitude of the mean temperature of 0° C. was 4,900 m. over Brownsville in September and was 3,100 m. over Sault Ste. Marie. The altitude of this level was on the average 4,500 m. or higher at all Weather Bureau stations in the United States south of 35° N. latitude. The level of freezing temperatures in the free air was lower than in August; being 1,200 m. lower at Medford, 800 m. lower at Lakehurst, but only 100 or 200 m. lower than in August over the central part of the country.

All stations have this month reported absolute minimum temperatures as observed in free air to the nearest tenth of a degree, as well as the level at which this minimum was recorded and the date on which it occurred. The minimum temperature for the month reported by Weather Bureau stations was −79.8° C. (−112° F.) reported as occurring on September 25 at 15.3 km. (about 9.5 miles) above Brownsville, Tex. The highest minimum temperature for the United States during September was reported on September 22 as −60.5° C. (−77° F.) at an altitude of 15.6 km. over Seattle, Wash.

Table 3 shows the maximum free air wind velocities and their directions for various sections of the United States during September as determined by pilot-balloon observations. The extreme maximum for the month was 78.0 m. per second (174 m. p. h.) observed over San Antonio, Tex. on September 12. This high velocity wind was blowing from the WNW. at an elevation of 21,230 m. (about 13 miles) above sea level. A maximum 57.6 m. per second for the month of September occurred last year over Cleveland, Ohio, at 12,400 m. above sea level. It is noted that as far as was determined by pilot-balloon observations the maximum free air wind velocity was higher in September 1940 than it was in this month during the years 1937, 1938, and 1939 and that this was true both in the free-air layer from 2,500 meters to 5,000 m. and in the free air above 5,000 m.

Tropopause data for September showing the mean altitude and temperature of the tropopause at various stations are shown in table 4 and on chart XIII.

MEAN ISENTROPIC CHART [1]

The circulation for September 1940 was dominated by a major anticyclonic eddy central over the Plains States. Within the major vortex three distinct tongues, two moist and one dry, appeared. The major eddy showed above normal intensity and covered a large area, thus displacing the dry anticyclonic tongue east of its normal position and causing below normal precipitation over the Southeastern States.

Surface temperature departures were in general positive below the northward-moving currents and negative below the southward-moving currents. The large positive precipitation departures over the Western States are typical of the left side of a well-developed moist tongue, whereas the deficiencies over northern Missouri and southern Iowa apparently were due to the splitting of the moist tongue. The southern branch of the moist tongue probably showed its most pronounced development in the early part of the month when flood rains occurred in southeastern Kansas and northeastern Oklahoma. The isohyets for this storm showed a definite NW.-SE. orientation with a center of 19.75 inches near Hallett, Okla.

[1] Prepared by A. K. Showalter, Hydrometeorological Section.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1940*

Altitude (meters) m. s. l.	Brownsville, Tex. (6 m.)				Bismarck, N. Dak. (505 m.)				Charleston, S. C. (14 m.)				Denver, Colo. (1,616 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,117 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,014	23.3	85	30	958	14.7	76	30	1,015	19.7	88	29	841	15.6	78	30	883	22.5	48	30	810	11.3	65	30	890	15.4	64
500	30	958	21.9	83					30	960	20.4	70																
1,000	30	905	19.0	76	30	904	18.4	56	30	906	18.2	68																
1,500	30	853	16.9	67	30	852	16.1	54	30	854	15.4	71					30	853	22.8	47					30	851	15.0	59
2,000	30	804	14.4	61	30	803	13.5	50	30	805	12.7	66	29	804	16.0	64	30	804	19.6	49	30	801	12.4	61	30	802	12.0	60
2,500	30	758	11.8	60	30	756	10.8	48	30	758	10.4	62	29	758	13.8	60	30	759	16.0	52	30	755	11.4	54	30	755	8.6	64
3,000	30	714	9.0	54	30	712	7.8	48	30	714	7.9	59	29	714	10.7	60	30	715	12.1	57	30	711	7.7	55	30	710	5.3	65
4,000	30	632	4.2	43	29	630	1.2	49	30	632	2.9	42	29	632	3.6	70	30	634	4.4	68	29	629	−0.3	63	30	628	−1.2	65
5,000	30	559	−0.4	39	29	556	−5.5	47	30	558	−2.5	33	28	558	−3.7	78	30	560	−2.3	70	29	554	−6.8	63	29	553	−7.6	66
6,000	29	493	−6.0	35	28	489	−11.8	44	30	491	−8.6	30	28	491	−9.9	72	29	493	−7.1	61	29	487	−12.9	55	29	486	−14.1	61
7,000	28	433	−12.5	33	28	428	−18.9	42	30	431	−15.5	30	28	430	−16.3	61	29	434	−13.3	54	29	427	−20.1	49	29	425	−21.4	58
8,000	28	379	−19.4	31	27	373	−26.7	41	30	377	−22.7	30	27	376	−23.6	55	29	379	−20.6	50	29	372	−28.1	50	29	370	−29.2	57
9,000	28	330	−26.6	29	27	324	−34.4	41	29	328	−30.1	30	27	327	−31.3	52	29	330	−28.1	49	29	323	−35.8	49	29	321	−37.3	57
10,000	28	287	−34.2	29	27	280	−42.2		29	284	−37.8		26	284	−39.3	51	29	287	−35.7	49	29	280	−43.1		28	278	−45.0	
11,000	27	248	−41.6		26	241	−49.4		28	245	−45.5		26	244	−46.9		29	248	−43.0		28	240	−49.1		28	238	−51.3	
12,000	27	214	−48.6		26	207	−55.2		27	211	−52.4		25	210	−52.8		29	214	−50.0		28	206	−53.3		28	204	−54.7	
13,000	27	183	−55.7		26	176	−58.0		27	180	−58.6		25	179	−57.6		29	183	−56.9		27	176	−56.5		28	175	−56.6	
14,000	27	156	−62.4		26	150	−59.4		27	153	−63.5		24	153	−61.3		28	156	−63.1		27	150	−59.0		26	149	−57.9	
15,000	26	133	−67.8		26	127	−60.5		26	130	−66.4		24	130	−64.7		28	132	−68.5		26	128	−61.1		26	127	−58.7	
16,000	26	112	−71.0		25	109	−61.2		25	111	−67.9		24	110	−66.0		27	112	−72.0		26	109	−62.4		25	108	−59.6	
17,000	24	95	−71.5		20	92	−61.2		23	94	−67.8		24	93	−66.1		27	94	−71.5		24	93	−62.5		23	92	−59.8	
18,000	22	80	−69.7		20	78	−60.3		21	79	−65.8		22	79	−64.3		24	80	−68.3		22	79	−61.4		21	78	−60.6	
19,000	19	68	−66.2		18	67	−59.2		21	67	−63.8		22	67	−61.9		23	68	−64.9		19	67	−59.7		18	67	−59.6	
20,000	12	57	−62.8		16	57	−57.9		18	57	−61.1		17	57	−60.1		15	57	−61.6		17	57	−58.3		11	56	−58.4	
21,000	7	48	−60.6		10	48	−56.6		9	48	−59.5		12	48	−58.7		5	49	−59.7		10	48	−57.1					
22,000	5	41	−57.7										10	41	−57.4													
23,000													5	35	−55.6													

Altitude (meters) m. s. l.	Joliet, Ill. (178 m.)				Lakehurst, N. J.[1] (39 m.)				Medford, Oreg. (401 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1 2] (10 m.)				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	29	998	13.7	85	30	1,012	13.1	91	29	966	16.5	72	30	996	17.7	76	25	1,019	19.3	87	30	1,013	17.0	80	30	972	19.4	72
500	29	961	16.9	65	30	958	14.7	67	29	955	16.8	68	30	960	19.6	66	25	962	18.9	70	30	956	15.2	79	30	960	20.2	65
1,000	29	906	14.0	65	30	903	12.0	62	29	900	14.9	66	30	906	17.0	65	25	908	15.5	69	30	901	14.2	65	30	906	19.3	57
1,500	29	853	10.7	69	30	851	8.7	63	29	849	11.9	71	30	854	13.5	68	25	855	12.3	64	30	849	12.3	58	30	855	17.0	56
2,000	29	804	8.5	58	30	800	5.8	59	29	799	8.9	75	30	805	11.0	63	25	806	9.7	55	30	800	9.8	54	29	806	14.4	55
2,500	29	756	6.6	47	30	752	4.0	45	29	752	5.6	72	30	758	8.6	58	25	759	7.3	46	30	753	7.3	47	29	759	11.3	56
3,000	29	711	4.4	45	30	707	2.2	40	29	707	2.6	68	30	713	6.2	53	25	713	4.6	42	30	708	4.9	42	29	715	8.2	58
4,000	29	628	−1.0	42	30	624	−2.7	34	29	624	−3.5	61	30	630	0.8	48	25	631	0.3	29	29	626	−0.3	36	29	633	2.3	68
5,000	29	554	−7.3	42	29	549	−8.3	33	29	550	−8.9	54	30	556	−4.9	44	24	556	−5.5	28	29	552	−6.2	33	27	559	−3.7	56
6,000	29	486	−13.9	36	29	482	−14.6	36	29	482	−15.4	47	30	489	−11.5	41					29	485	−12.9	34	26	492	−9.1	47
7,000	29	425	−21.3	36	29	422	−21.6	35	29	422	−22.6	44	30	429	−18.2	39					29	424	−20.3	34	26	432	−16.2	41
8,000	29	371	−29.1	37	29	367	−29.0	36	29	367	−31.0	42	28	374	−25.9	37					29	370	−28.3	33	26	377	−24.0	40
9,000	29	322	−36.8	39	29	318	−36.1	34	29	318	−39.1	41	28	325	−34.0	36					28	321	−36.6	33	26	328	−32.0	39
10,000	28	278	−44.1		28	276	−43.1		28	274	−46.2		28	281	−41.8						28	277	−44.5		26	284	−39.8	38
11,000	28	239	−50.5		27	237	−49.4		28	236	−51.3		28	242	−48.9						28	239	−50.4		25	245	−47.3	
12,000	28	204	−55.3		27	204	−54.2		27	202	−53.6		28	208	−54.8						28	204	−53.6		24	210	−54.2	
13,000	26	175	−57.6		27	174	−57.4		27	173	−54.7		28	178	−58.9						28	174	−55.6		24	180	−60.1	
14,000	25	149	−59.8		26	148	−59.4		26	148	−56.1		26	151	−62.4						28	149	−57.6		24	153	−64.6	
15,000	25	127	−61.4		25	126	−60.3		24	126	−57.9		25	128	−64.8						26	127	−59.6		24	130	−68.5	
16,000	25	108	−62.1		22	108	−60.4		23	108	−59.1		24	109	−65.8						25	108	−60.9		24	110	−70.4	
17,000	25	92	−61.5		19	92	−59.6		22	92	−59.5		23	93	−65.2						23	92	−61.2		22	93	−69.5	
18,000	23	78	−60.1		14	78	−58.6		21	78	−59.2		22	79	−63.4						22	78	−60.4		22	78	−66.7	
19,000	20	67	−58.5		8	66	−57.5		15	66	−58.9		17	67	−61.3						16	67	−59.4		20	66	−63.8	
20,000	11	57	−57.2						15	56	−58.4		11	57	−58.9						9	57	−58.2		18	56	−61.1	
21,000	7	48	−56.2						5	48	−58.0		8	48	−57.5						5	48	−57.5		13	48	−58.9	
22,000													5	41	−56.1										8	41	−56.7	
23,000																									7	35	−55.5	
24,000																									7	29	−54.4	

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during September 1940*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																			
	Omaha, Nebr. (301 m.)				Pearl Harbor, T. H.[1 2] (6 m.)				Pensacola, Fla.[1 5] (24 m.)				Phoenix, Ariz. (339 m.)				San Diego, Calif.[1 5] (19 m.)				Sault Ste. Marie, Mich. (221 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	983	18.1	72	30	1,014	23.3	85	28	1,015	21.2	82	30	971	26.7	55	30	1,011	18.3	87	29	991	11.2	94
500	30	961	19.2	64	30	959	22.0	81	28	960	21.8	69	30	954	29.3	44	30	955	17.7	74	29	959	11.7	89
1,000	30	906	17.7	57	30	905	19.2	80	28	906	18.4	69	30	901	27.3	40	30	901	18.4	48	29	903	10.3	85
1,500	30	855	15.3	53	30	854	16.6	74	28	855	15.3	67	30	852	23.5	43	29	850	18.0	39	29	851	7.9	80
2,000	30	805	12.7	53	30	805	14.3	66	28	806	13.0	59	30	803	19.6	49	29	801	15.7	38	29	800	5.3	74
2,500	30	758	10.0	51	30	759	12.7	48	28	758	10.5	53	30	758	15.6	55	29	755	13.1	38	29	752	2.8	72
3,000	29	714	7.2	47	30	715	11.0	36	28	714	7.5	49	30	714	11.7	62	23	711	9.9	37	29	707	0.4	66
4,000	29	632	0.9	47	30	633	6.3	24	27	632	1.0	43	29	633	4.4	67	13	630	3.3	39	28	623	−5.9	62
5,000	29	557	−4.7	42					9	558	−4.9	46	29	560	−1.5	62	11	556	−3.0	38	26	548	−12.1	56
6,000	29	490	−10.9	36					9	492	−11.3	45	29	493	−7.4	55	11	489	−9.7	26	26	480	−18.0	50
7,000	29	430	−17.8	34					9	431	−18.0	45	29	433	−13.9	48	11	429	−17.2		26	419	−25.7	48
8,000	29	375	−25.3	33					8	376	−25.3	45	29	379	−21.3	45	10	373	−25.3		26	364	−33.1	48
9,000	29	326	−33.4	33					8	327	−31.9		29	330	−29.2	42	9	324	−32.4		26	315	−40.7	46
10,000	29	282	−41.2						7	284	−39.2		29	287	−36.9	41	8	281	−39.2		26	272	−47.3	
11,000	28	243	−48.6						7	245	−47.6		29	247	−43.9		8	242	−44.3		25	233	−51.7	
12,000	28	208	−55.0						7	210	−55.5		29	213	−50.2		8	209	−49.5		23	200	−54.6	
13,000	26	178	−58.7						6	179	−63.6		29	182	−55.9		7	179	−55.7		22	171	−55.9	
14,000	24	151	−61.4						5	151	−71.7		29	155	−61.2		7	154	−60.4		22	146	−57.1	
15,000	24	129	−63.8										29	132	−65.5		7	130	−64.2		22	125	−57.9	
16,000	23	110	−64.2										28	112	−68.1		5	111	−66.8		17	106	−58.5	
17,000	22	93	−63.1										28	95	−68.1						14	91	−58.3	
18,000	20	79	−61.5										25	80	−66.3						10	78	−57.9	
19,000	16	67	−59.8										22	68	−63.6						6	66	−56.8	
20,000	10	57	−57.6										19	58	−60.4									
21,000													12	49	−58.1									
22,000													7	41	−56.8									

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																			
	Seattle, Wash.[1] (27 m.)				St. Thomas, V. I.[1 2] (8 m.)				Washington, D. C.[1] (7 m.)				Atlantic Station No. 1[3] (3 m.)				Atlantic Station No. 2[4] (3 m.)				Atlantic Station No. 1[3] (late report for August 1940) (3 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	21	1,011	15.7	83	29	1,014	27.4	83	20	1,018	15.2	82	23	1,016	22.3	72	27	1,019	22.3	82	26	1,020	23.1	72
500	21	956	15.2	67	29	958	21.6	97	20	960	14.8	70	23	959	17.9	78	27	962	18.6	85	26	962	19.3	78
1,000	21	902	12.8	64	29	904	18.5	90	20	905	12.3	68	23	905	14.4	81	27	907	15.3	85	26	908	15.6	80
1,500	21	850	10.4	66	29	853	16.0	80	20	852	9.3	67	23	853	11.9	77	27	855	12.8	82	26	856	12.8	75
2,000	21	800	7.8	61	29	804	13.5	73	20	802	7.2	56	23	803	10.3	68	27	806	10.8	74	25	806	10.9	62
2,500	21	752	4.5	63	29	757	11.2	69	20	754	5.9	43	23	756	8.2	62	27	758	8.5	68	25	759	9.3	52
3,000	21	707	1.4	65	29	713	8.7	61	20	709	3.9	36	23	712	6.0	56	27	714	6.1	62	25	714	7.0	49
4,000	21	624	−4.1	50	29	632	2.9	52	20	626	−1.8	44	23	629	1.0	49	27	631	0.9	49	22	632	1.6	47
5,000	21	549	−10.0	44					19	551	−7.3	46	23	555	−4.9	45	27	557	−4.8	42	22	558	−3.9	43
6,000	21	481	−16.6	36					19	484	−13.6	51	23	488	−10.8	43	27	490	−11.2	40	20	490	−10.0	39
7,000	20	421	−24.3	36					19	424	−19.9	49	23	428	−18.0	40	27	429	−18.2	39	19	430	−16.5	37
8,000	20	366	−31.9	43					13	371	−27.1		21	373	−25.8	40	26	375	−25.6	39	19	375	−23.9	36
9,000	16	317	−39.8						12	321	−34.7		19	324	−33.4	41	26	325	−33.2	39	17	326	−31.6	36
10,000	16	273	−47.3						11	278	−42.1		19	281	−41.3		26	282	−41.1		16	283	−39.8	38
11,000	12	234	−51.3						9	239	−48.6		17	241	−49.0		25	243	−48.8		15	244	−47.0	
12,000	10	202	−52.4						7	204	−54.5		16	207	−54.8		25	208	−55.4		13	209	−53.2	
13,000	9	173	−53.1						6	175	−57.5		16	177	−58.2		25	178	−59.7		11	178	−57.0	
14,000	8	149	−54.0										16	150	−61.6		22	151	−61.4		9	152	−59.6	
15,000	7	127	−55.1										15	128	−63.6		20	129	−62.0		7	129	−61.0	
16,000	6	108	−55.5										13	109	−63.2		18	110	−61.9					
17,000	5	92	−55.7										13	93	−62.3		16	93	−61.3					
18,000													12	79	−60.7		12	79	−60.1					
19,000													12	67	−59.2		9	68	−58.9					
20,000													8	57	−67.8		7	58	−57.7					
21,000																	5	50	−56.7					

[1] U. S. Navy.
[2] Airplane observations.
[3] In or near the 5° square. Lat. 35°00′ N. to 40°00′ N.; long. 55°00′ W. to 60°00′ W.
[4] In or near the 5° square. Lat. 40°00′ N. to 45°00′ N.; long. 40°00′ W. to 45°00′ W.
[5] Airplane and radiosonde observations.

NOTE.—All observations taken at 12:30 a. m., 75th meridian time, except at Washington, D. C., and Lakehurst, N. J., where they are taken near 5 a. m., E. S. T., at Norfolk, Va., where they are taken at about 6 a. m. and at Pearl Harbor, T. H., after sunrise.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels; also, the humidity data are not used in daily observations when the temperature is below −40.0° C.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during September 1940. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (18 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (157 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	121	3.3	30	216	1.5	30	26	2.2	29	79	2.2	30	130	2.1	28	29	0.3	30	62	5.2	29	263	3.0	30	254	0.7	29	87	1.5	30	353	0.8	30	330	0.5	29	13	1.4
500							30	22	2.5										30	57	5.5	29	266	4.1	30	264	1.6	29	63	2.4	30	337	.9	30	338	1.4			
1,000	30	125	4.1				30	42	1.9				30	136	1.6	28	74	.2	30	44	3.7	29	274	5.1	29	289	3.9	27	37	2.1	30	279	2.5	30	320	1.7			
1,500	30	139	3.5				30	34	1.9	29	92	2.5	30	160	2.1	28	154	1.3	28	21	3.5	29	280	5.7	27	300	5.3	26	6	2.3	30	282	3.9	30	306	2.1			
2,000	29	140	3.2	30	211	2.0	28	44	2.3	29	114	2.1	29	190	2.6	27	160	2.0	24	24	3.7	27	286	6.0	24	302	6.3	22	336	2.7	26	297	3.4	29	312	2.4	29	45	1.2
2,500	27	158	2.3	30	217	2.4	28	28	2.5	28	184	2.2	26	249	2.5	26	186	2.6	23	19	4.0	23	298	6.0	18	311	7.1	22	328	2.7	24	294	3.4	27	318	3.5	27	102	1.4
3,000	25	123	1.0	30	228	2.5	28	14	2.8	27	217	3.9	25	269	3.9	24	191	3.6	21	14	4.2	19	310	6.1	11	315	7.5	20	317	2.5	19	294	4.8	24	316	4.7	27	133	1.5
4,000	23	324	2.6	29	234	4.2	26	331	2.0	25	237	7.5	23	284	6.0	23	210	7.0	17	28	2.5	15	309	7.1				17	300	3.8	17	317	5.9	22	323	6.4	26	235	3.4
5,000	21	323	4.2	27	248	6.2	20	309	4.3	23	237	8.9	22	288	7.2	18	206	8.8	15	340	3.3	12	320	8.4				16	286	4.9	17	330	5.8	19	326	6.5	22	255	6.3
6,000	21	309	5.1	26	242	7.1	20	288	6.0	22	240	8.9	18	294	9.6	15	209	10.6	13	318	4.5	10	328	8.9				14	288	5.8	15	324	8.1	14	324	6.8	17	253	6.7
8,000	21	308	7.8	17	244	10.4	18	278	10.0	17	242	12.7	14	294	10.0	10	212	11.4	11	308	8.4							13	286	9.2	14	329	9.3	10	304	9.7	16	247	8.8
10,000	19	305	12.1	14	248	15.7	17	274	11.8	14	239	17.4	12	304	15.1													11	277	12.1	12	319	12.6				13	259	12.5
12,000	19	308	18.9	11	258	21.5	14	274	14.9																												12	261	17.4
14,000	18	323	11.6				13	269	14.9																														
16,000	12	304	13.2				12	266	8.1																														

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (766 m.)			Jacksonville, Fla. (14 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (79 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Minneapolis, Minn. (261 m.)			Mobile, Ala. (10 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	154	2.2	30	193	4.9	29	320	1.3	30	23	1.7	29	141	0.4	27	65	3.4	30	173	2.3	30	71	1.2	30	316	1.3	30	47	2.2	30	186	1.0	30	85	1.5	29	6	1.5
500										30	30	2.0				26	61	4.7				30	43	2.3	30	315	1.7	30	50	3.0	30	184	2.1	30	64	2.6	29	11	2.0
1,000										29	15	2.4	29	196	.8	24	62	3.7	30	165	3.3	30	33	2.2	30	285	1.1	30	65	1.7	30	229	2.2	28	62	3.0	29	8	2.4
1,500	30	157	1.9				29	313	1.9	29	355	2.5	29	211	1.3	21	59	2.5	30	175	3.8	30	25	2.1	30	166	1.9	29	79	1.5	29	247	3.9	25	52	4.6	29	358	2.1
2,000	30	159	2.3	30	194	5.0	29	296	2.2	29	336	3.7	29	204	2.0	21	48	1.6	30	196	5.6	30	28	2.9	27	174	3.1	27	85	.8	27	268	4.8	24	54	4.6	29	340	2.7
2,500	30	173	1.7	30	189	5.5	29	235	2.7	27	326	4.6	29	221	2.7	20	73	1.3	30	198	6.9	28	22	2.2	26	174	5.1	27	193	.4	26	275	5.9	22	60	5.0	28	329	3.4
3,000	30	180	2.2	30	192	5.7	29	217	4.4	27	316	5.3	25	241	4.6	21	343	3.9	29	205	8.4	24	359	2.5	25	174	6.2	26	188	1.1	24	294	6.5	18	37	4.2	25	335	3.3
4,000	28	235	2.7	28	209	8.0	28	210	5.8	26	306	6.4	22	237	6.1	16	286	1.0	27	215	11.0	22	359	2.3	21	182	7.8	22	183	1.3	15	307	7.4	17	31	2.0	20	332	3.1
5,000	22	248	3.6	23	215	11.4	24	207	5.9	23	308	6.6	17	233	8.1	15	283	2.4	24	220	12.7	19	330	2.9	15	175	6.6	18	196	1.6	12	318	6.3	16	351	2.1	16	312	4.3
6,000	15	244	4.6	19	219	14.6	16	224	7.7	22	293	9.5	14	238	8.4	12	293	3.7	24	228	13.3	19	329	5.4	12	169	7.0	16	218	2.1							15	317	6.4
8,000				12	220	13.3				21	288	12.4	11	226	9.3				19	230	18.5	10	328	9.4	10	189	5.0											
10,000										21	281	15.1							16	239	24.7																	
12,000										15	268	17.6							13	243	28.9																	
14,000										11	270	15.2																											

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (344 m.)			Rapid City S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (183 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (14 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (10 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	311	1.1	30	273	5.0	29	159	3.3	30	166	3.1	30	182	0.7	29	116	1.8	30	1	0.9	30	81	2.5	29	289	4.2	27	284	1.9	29	279	2.2	25	177	0.7	30	315	1.1
500	30	305	2.3	30	277	4.9	29	159	3.6	30	170	4.0	30	185	1.0				30	19	1.2	30	75	3.6	29	291	3.0	27	288	3.3	29	283	.5				30	317	2.4
1,000	29	299	4.2	29	266	2.2	29	167	3.5	29	184	3.7	30	184	1.9	29	116	1.7	30	332	.4	30	66	3.5	28	218	1.9	24	288	5.9	27	206	.6	25	154	.9	30	318	3.2
1,500	28	299	5.6	28	195	2.5	28	174	3.4	28	212	4.0	30	179	2.7	29	122	1.7	30	272	1.0	29	66	3.6	28	198	3.4	21	297	7.8	22	166	2.6	25	143	1.6	29	308	5.1
2,000	24	315	6.3	28	184	3.8	28	185	3.1	28	241	3.8	30	188	3.8	29	159	1.8	30	296	2.7	28	58	3.2	28	191	5.1	18	304	6.9	19	174	4.3	24	174	2.2	28	310	5.8
2,500	22	306	6.2	28	179	4.9	27	228	2.4	28	271	3.2	30	203	4.6	28	215	2.1	29	301	3.3	26	51	3.0	26	188	5.8	16	313	7.1	16	146	3.4	22	183	3.8	26	309	7.2
3,000	20	300	6.9	28	181	5.2	26	240	2.3	28	286	3.9	29	206	5.5	25	230	3.6	27	308	3.8	25	39	3.2	25	202	6.9	14	305	9.1	15	140	3.3	21	188	3.3	23	310	7.9
4,000	16	299	7.6	26	214	5.5	23	299	4.1	23	303	4.9	25	220	7.5	21	261	6.0	26	324	5.0	25	14	4.0	22	206	9.0				14	146	5.3	19	197	5.3	18	295	8.5
5,000	12	299	9.4	25	227	7.6	19	324	5.0	22	303	7.0	25	222	6.4	21	263	7.5	22	333	6.3	23	348	3.3	20	214	10.0				13	166	3.3	14	203	8.2	15	280	10.3
6,000				23	237	8.9	19	321	6.2	21	305	8.6	24	226	8.6	20	260	8.5	21	322	7.3	20	320	5.3	10	226	10.4				13	188	5.0	12	212	8.5	13	290	11.9
8,000				18	229	11.1	17	316	9.3	21	306	12.1	19	231	12.2	17	263	12.1	19	324	12.0	15	299	8.1							12	213	6.4	12	215	10.7			
10,000				13	268	10.6	11	320	14.8	18	311	16.2	18	241	18.5	13	261	15.2	13	339	15.6	13	296	10.8										11	221	16.9			
12,000				10	244	15.8				14	297	17.4	15	237	23.8	10	261	18.4	10	334	15.7	10	300	15.8															
14,000				10	253	18.0				12	294	17.0	12	240	20.8	10	254	16.2																					

TABLE 3.—*Maximum free-air wind velocities (m. p. s.), for different sections of the United States, based on pilot-balloon observations during September 1940*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	30.5	NW	2,500	21	Harrisburg, Pa.	43.0	WSW	4,880	10	Harrisburg, Pa.	46.5	NW	12,230	22	Columbus, Ohio.
East-Central [2]	29.0	WSW	1,580	25	Richmond, Va.	35.4	WNW	5,000	12	Nashville, Tenn.	49.2	NW	12,640	13	Louisville, Ky.
Southeast [3]	23.8	S	2,150	24	Montgomery, Ala.	27.1	WNW	5,000	11	Birmingham, Ala.	59.0	W	13,790	13	Charleston, S. C.
North-Central [4]	31.7	NNW	570	9	Duluth, Minn.	39.8	W	4,900	24	Sault St. Marie, Mich.	56.0	N	9,800	10	Bismarck, N. Dak.
Central [5]	30.4	SW	910	18	Des Moines, Iowa.	37.2	N	3,640	24	North Platte, Nebr.	70.4	WSW	18,810	27	Springfield, Ill.
South-Central [6]	32.5	SSE	1,900	29	Amarillo, Tex.	33.7	S	2,810	30	Amarillo, Tex.	78.0	WNW	21,230	12	San Antonio, Tex.
Northwest [7]	27.3	WSW	1,340	3	Great Falls, Mont.	30.8	S	4,490	4	Butte, Mont.	53.2	WSW	5,950	6	Missoula, Mont.
West-Central [8]	23.3	SSE	2,380	2	Sheridan, Wyo.	34.4	SW	5,000	4	Rock Springs, Wyo.	49.5	SW	10,100	4	Ely, Nev.
Southwest [9]	28.1	SW	2,500	27	Las Vegas, Nev.	41.1	SW	3,180	27	Las Vegas, Nev.	68.8	WSW	11,432	15	Las Vegas, Nev.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except extreme west Texas), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during September 1940, classified according to the potential temperatures (10° intervals between 290° and 409 °A.) with which they are identified (based on radiosonde observations)*

Stations	Bismarck, N. Dak.			Brownsville, Tex.			Charleston, S. C.			Denver, Colo.			El Paso, Tex.			Ely, Nev.			Great Falls, Mont.		
Potential temperatures, °A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299																					
300–309																					
310–319	1	8.1	−38.0													2	8.8	−44.5	1	9.2	−46.0
320–329	7	9.6	−44.6				2	8.8	−33.5	2	9.2	−38.0				17	9.3	−41.2	14	9.9	−48.6
330–339	29	10.9	−49.6	7	9.8	−36.7	10	10.6	−45.5	21	10.8	−48.3	8	10.1	−39.4	35	10.8	−48.2	27	11.0	−51.6
340–349	20	12.2	−56.3	14	11.4	−46.4	21	12.2	−54.6	25	11.8	−52.8	18	11.5	−47.6	15	12.1	−55.8	8	12.4	−58.2
350–359	10	13.3	−61.0	21	13.6	−61.1	18	13.4	−61.7	7	13.3	−60.3	20	13.4	−60.2	10	13.0	−58.4	6	12.9	−57.8
360–369	5	13.7	−59.6	16	14.8	−67.8	7	14.4	−64.4	10	14.9	−67.8	14	15.1	−70.3	10	13.7	−59.8	3	14.1	−62.7
370–379	2	14.0	−57.0	12	15.7	−71.2	9	15.4	−68.9	7	15.1	−66.3	14	15.8	−72.4	7	14.3	−60.0	6	14.4	−60.0
380–389	7	15.2	−62.4	12	16.4	−72.4	7	15.6	−66.1	4	15.8	−67.0	6	16.5	−73.7	11	15.2	−62.0			
390–399	6	15.7	−62.8	4	17.0	−71.5	5	16.5	−70.0	2	16.3	−68.0	8	16.9	−71.6	6	16.0	−63.8	4	15.6	−60.2
400–409	5	16.2	−61.4	3	17.5	−73.3	8	16.9	−68.2	7	16.7	−66.1	1	17.6	−73.0	6	16.4	−63.2	3	16.3	−62.3
Weighted means		12.5	−55.0		14.1	−61.8		13.7	−59.9		13.0	−56.9		14.0	−61.4		12.3	−53.4		12.0	−54.3
Mean potential temperature °A. (weighted)	351.3			363.7			361.0			354.7			361.8			351.8			345.6		
Number days with observations	27			26			26			26			28			28			28		

Stations	Joliet, Ill.			Lakehurst, N. J.			Medford, Oreg.			Nashville, Tenn.			Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.		
Potential temperatures, °A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299																					
300–309																					
310–319	3	8.4	−41.3	1	8.0	−36.0	1	7.0	−38.0										1	9.2	−47.0
320–329	16	9.6	−45.4	8	9.1	−41.1	3	7.9	−40.0												
330–339	22	11.1	−50.9	18	10.8	−50.8	31	9.6	−45.4	8	9.0	−42.5	19	9.7	−44.7	4	10.1	−48.2	9	9.9	−46.0
340–349	17	12.1	−57.0	9	12.2	−57.1	26	10.9	−51.5	21	10.9	−50.2	30	11.0	−50.7	16	10.8	−48.0	25	10.9	−49.0
350–359	5	13.1	−59.2	7	13.0	−58.7	9	12.1	−56.3	14	12.1	−55.5	12	12.2	−56.7	18	12.2	−54.9	16	12.1	−55.6
360–369	5	14.1	−62.8	4	14.0	−62.5	4	12.8	−56.5	10	13.8	−64.4	2	12.8	−57.5	11	13.7	−63.2	6	13.4	−61.0
370–379	5	14.1	−62.8	4	14.0	−62.5	4	13.0	−53.7	8	14.2	−65.2	3	13.5	−56.7	8	15.1	−69.9	5	14.2	−63.2
380–389	5	14.6	−62.8	1	14.4	−60.0	5	14.1	−58.2	6	15.0	−65.5	5	14.4	−60.8	7	15.5	−70.4	11	15.0	−65.3
390–399	4	15.4	−64.5	1	14.8	−57.0	7	14.7	−58.0	8	15.4	−64.5	8	15.3	−62.2	11	16.2	−71.1	4	15.5	−65.0
400–409	5	15.5	−61.0	5	15.5	−62.8	3	15.9	−62.0	5	16.4	−66.2	6	15.7	−61.0				5	16.2	−66.6
	5	16.2	−62.0	1	16.2	−62.0	6	15.1	−60.0	2	17.0	−67.5	2	16.1	−61.5	3	16.9	−68.7	2	16.8	−64.5
Weighted means		12.2	−54.4		11.9	−53.6		11.5	−51.5		12.8	−57.5		12.0	−53.2		13.4	−60.1		12.6	−55.9
Mean potential temperature °A. (weighted)	349.1			347.3			345.4			353.6			348.4			355.9			351.4		
Number days with observations	28			28			30			28			28			24			27		

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during September 1940, classified according to the potential temperatures (10° intervals between 290° and 409 °A.) with which they are identified (based on radiosonde observations)*—Continued

Stations	Phoenix, Ariz.			Sault Ste Marie, Mich.			Swan Island, W. I.			Atlantic Sta. No. 1 [1]			Atlantic Sta. No. 2 [2]		
Potential temperatures ° A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299				1	5.5	−31.0									
300–309				5	6.9	−37.8									
310–319				14	8.4	−44.6				1	8.8	−46.0			
320–329	1	8.7	−38.0	19	10.3	−52.5				5	9.7	−45.8	2	9.6	−44.5
330–339	16	9.9	−38.8	15	11.1	−53.7				14	11.3	−53.3	20	11.1	−51.0
340–349	27	11.4	−47.2	9	12.2	−57.8	20	11.8	−49.2	8	12.3	−57.9	19	12.5	−58.8
350–359	15	13.2	−58.7	2	12.4	−58.5	20	13.6	−61.6	4	13.7	−63.7	10	13.3	−60.8
360–369	15	14.5	−64.4	2	13.0	−56.5	18	15.5	−74.1	5	14.2	−64.6	4	14.3	−65.8
370–379	16	15.4	−67.4	3	14.6	−62.3	9	16.4	−77.4	5	14.8	−63.6	4	15.0	−66.0
380–389	12	16.2	−69.8	6	14.4	−57.3	5	17.2	−80.0	4	15.2	−64.0	1	14.8	−61.0
390–399	2	16.6	−69.5	1	15.1	−56.0				1	15.6	−62.0			
400–409	7	17.1	−69.4	5	16.0	−59.0	1	17.7	−77.0	1	16.2	−60.0			
Weighted means		13.4	−56.9		11.1	−52.2		14.2	−64.7		12.6	−57.5		12.4	−57.0
Mean potential temperature °A. (weighted)	360.0			338.9			359.6			350.4			345.9		
Number days with observations	29			24			24			18			23		

[1] In or near the 5° square: Lat. 35°00′ N. to 40°00′ N. Long. 55°00′ W. to 60°00′ W.
[2] In or near the 5° square: Lat. 40°00′ N. to 45°00′ N. Long. 40°00′ W. to 45°00′ W.

WEATHER ON THE NORTH ATLANTIC OCEAN

By H. C. HUNTER

Atmospheric pressure.—The pressure was lower than normal over most North Atlantic waters that are covered by reports at hand. There was a considerable deficiency from the vicinity of New England southward to the northern West Indies, the station at Turks Island having average pressure 2.5 millibars (0.074 inch) less than normal. On the other hand, pressure averaged somewhat greater than normal near northern Newfoundland. At Horta the pressure was nearly always above normal save for one week starting the 20th, when it was below, part of the week decidedly so.

The extremes of pressure found in vessel reports at hand were 1031.8 and 965.1 millibars (30.47 and 28.50 inches). The higher reading was noted on the American liner *Exeter*, late on the 13th, a short distance south of the central Azores. Table 1 indicates slightly higher readings at the land station at Horta within a few hours of that time.

The low mark was recorded on the American steamship *Franklin K. Lane*, near 38° N., 70½° W., at 9 p. m. of the 1st, when it met one of the intense storms from the Tropics. Readings quite low for that part of the ocean were noted in or near the Azores area, on both ship and shore, during the 23d to 25th, as detailed below. In high latitudes a reading of 995.6 millibars (29.40 inches) was recorded near Cape Farewell, on the 1st.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, September 1940*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Lisbon, Portugal [1]			1,023	10	1,008	30
Horta, Azores	1,020.9	−0.8	1,032	13, 14	994	25
Belle Isle, Newfoundland [2]	1,014.5	+2.3	1,028	15	999	26
Halifax, Nova Scotia	1,016.3	−1.3	1,028	29, 30	986	16
Nantucket	1,016.3	−2.3	1,028	30	993	2
Hatteras	1,016.3	−1.7	1,026	18	1,003	11
Turks Island	1,012.7	−2.5	1,016	24, 25	1,005	13
Key West	1,012.2	−1.7	1,017	18	1,007	9
New Orleans	1,015.6	+0.4	1,022	29	1,007	24

[1] For 16 days. [2] For 25 days.

NOTE.—All data based on available observations, departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—The reports now available fail to indicate that any LOW which had come eastward over the North American continent was of much importance when over North Atlantic waters. During the first 3 weeks of the month the middle latitudes of the ocean were comparatively quiet, except as influenced by storms originating near or within the Tropics.

A LOW of unusual interest was noted early on the 22d, when the American steamship *Otho*, westbound, near 29½° N., 46½° W., met a south-southwest whole gale, the barometer dropping to 995.6 millibars (29.40 inches). The wind shifted from south to west-northwest. Late in the forenoon of the 23d this storm was encountered by the Portuguese steamship *Lobito*, about 700 miles to east-northeastward of the *Otho's* position, the wind blowing with full hurricane force from the southwest, while the barometer was 977.0 millibars (28.85 inches).

Later on the 23d this storm was felt in the westernmost Azores. The following extract is from a report kindly furnished to this office by the Meteorological Service of the Azores, Angra do Heroismo, Terceira Island:

> The storm * * * came over the Azores, passing south of Flores and Fayal—minimum pressure, at Horta 992 mb. (29.29 inches) at 4 h. the 24th—and turning northeast passed over San Miguel—minimum 984 mb. (29.06 inches) at 13 h. the 24th. (Hours herein are 30th meridian time.)
>
> It went then around, coming west-southwest to Terceira where the central calm was well felt near 7 h. 30 m. the 25th—minimum 984 mb.—passed again south of Fayal—second minimum 991 mb. (29.26 inches) at 19 h. 30 m.—and it disappeared westward on the 26th, after being felt a second time at Flores Island.
>
> Wind attained force 9 and sometimes 10 (Beaufort), stronger before the passing of the center. Maximum 105 kilometers (65 miles) per hour at 4 h. 45 m. on the 25th, from the north—a gust, not steady velocity.
>
> Rain was unusually heavy from the 22d to the 26th. At Angra do Heroismo 333 mm. (13.11 inches) of rain were collected, that is, one-third of the average total rain in a year.
>
> Many damages were caused to houses and crops, and some boats were taken by the heavy seas from the places where they had been pulled ashore. An uncommonly high swell was remarked